
Complex numbers with MATLAB for E11

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This document shows the basics of how to work with complex numbers in MATLAB.

Defining numbers

```
format compact % Get rid of extraneous white space in MATLAB output
```

Define a real number

```
x=3
```

```
x =  
    3
```

The numbers i and j are predefined as sqrt(-1)

```
j  
ans =  
    0.0000 + 1.0000i
```

```
i  
ans =  
    0.0000 + 1.0000i
```

Declaring a complex number in rectangular format

```
x=3+4*j  
x =  
    3.0000 + 4.0000i
```

or

```
x=3+4j  
x =  
    3.0000 + 4.0000i
```

or

```
x=complex(3,4)
```

```
x =  
    3.0000 + 4.0000i
```

Define another complex number using polar format

```
M=5; theta=pi*7/8;  
y = M*exp(j*theta)
```

```
y =  
   -4.6194 + 1.9134i
```

Real part

```
M*cos(theta)  
%
```

```
ans =  
   -4.6194
```

Imaginary part

```
M*sin(theta)
```

```
ans =  
    1.9134
```

Parts of a complex number

Real and imaginary parts

```
real(y)
```

```
ans =  
   -4.6194
```

```
imag(y)
```

```
ans =  
    1.9134
```

Complex conjugate

```
conj(y)
```

```
ans =  
   -4.6194 - 1.9134i
```

Magnitude

```
abs(y)
```

```
ans =  
     5
```

Phase (in radians)

```
angle(y)
```

```
ans =  
    2.7489
```

in degrees

```
angle(y)*180/pi
```

```
ans =  
    157.5000
```

Use arctan (with 2 arguments - rise, run)

```
atan2(imag(y),real(y))
```

```
ans =  
    2.7489
```

...but beware the atan function with only one argument your answer may be off by 180 degrees (or pi radians).

```
atan(imag(y)/real(y))
```

```
ans =  
   -0.3927
```

Math operations

Addition, subtraction, multiplication, division...

```
x+y
```

```
ans =  
   -1.6194 + 5.9134i
```

```
x-y
```

```
ans =  
    7.6194 + 2.0866i
```

```
x*y
```

```
ans =  
   -21.5119 -12.7373i
```

```
x/y
```

```
ans =  
   -0.2482 - 0.9687i
```

```
exp(y)
```

```
ans =  
   -0.0033 + 0.0093i
```

Published with MATLAB® R2014b